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Data processing instructional program for the secondary schools of Lee County Florida

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A DATA PROCESSING INSTRUCTIONAL PROGRAM FOR THE SECONDARY SCHOOLS OF LEE COUNTY, FLORIDA

By

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CHAPTER I

INTRODUCTION

Never before in the United States has the need for highly educated and skilled men been as critical as it is today. The personal development of the human resource is an absolute prerequisite to the Nation's social and economic growth. The impact of computers and automation is changing the world, and education must change with it.

> Machines do not improve themselves; this is still the work of highly improved men. And most technological advance is now the result not of the accident of inspiration or genius but of highly purposeful effort.[1]

We live in a time when knowledge is exploding. The schools represent one of the major sources for transmitting knowledge between generations. The business education curriculum, therefore, cannot remain static. Its scope must be broadened to include automation and data processing. Many schools already have well developed programs in data processing, but too many do not. This study will be concerned with the inauguration of data processing in the secondary schools of Lee County (Fort Myers), Florida.

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[1]John K. Galbraith, The Liberal Hour (Boston: Houghton Mifflin Co., 1960), 41.

Statement of the Problem

The Bureau of Labor Statistics predicts that employment opportunities for electronic computer personnel will rise 140 per cent (from 100,000 to 240,000) during the period from 1965 to 1975.[1] Dr. G. Truman Hunter of International Business Machines Corporation estimates that the data processing industry will offer more new career opportunities than almost any other major field between now and 1975.[2] There continues to be a shortage of personnel in this area. Businesses are looking to the high schools as one of the major sources for people needed in EDP.[3] The business education curriculum should not only prepare its students for entry-level jobs in data processing but encourage them to seek higher education in EDP.

Business education teachers cannot rely on college educations and work experiences received years ago. It will require diligence and dedication for teachers to keep abreast of the latest developments in data processing. Teachers must be oriented before they can fully understand literature in this area. One of the major barriers in

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[1]Arthur Wellington, "Occupational Opportunities for Business Education Graduates," National Business Education Quarterly, XXXVII (December, 1968), 5.

[2]"The Supersonic Seventies," Business Automation, XVII (January, 1970), 51.

[3]Ibid., 52.

implementing data processing into the secondary schools has been the lack of knowledge and education of the business education teachers in data processing.

Purpose of the Study

Prior to the Fall of 1969 the Lee County Board of Public Instruction, Lee County, Florida, did not utilize an electronic data processing system. During the summer of 1969, the Board contracted with the Lee County Commissioners to use their IBM 360, Model 40, to process pupil grade reporting and attendance for the 1969-70 school year. While these two projects are considered to be in the pilot stages, there are long-range plans to computerize the expansion of student records, scheduling, bus routing, bus scheduling, purchasing, vehicle expense, inventory, testing, budgets, and other administrative processes. There has been no consideration of instructional data processing.

The major purposes of this study were to:

(1) determine what was being accomplished in data processing in the business education curriculum in the Lee County secondary schools

(2) survey the business teachers of Lee County to ascertain their experience and education in the field of data processing

(3) prepare a course of study for teacher development in data processing if the teacher survey revealed a lack of knowledge and training in this area

(4) review the opinions and trends anticipated in data processing by educators, management, and computer manufacturers to determine the nature of data processing instruction at the high school level

(5) recommend a data processing curriculum for the Lee County secondary schools, Lee County, Florida

Delimitations

The study was restricted to the four secondary schools situated in Lee County, Florida (population 87,500). Fort Myers (population 35,000) is the county seat. All public schools are under the jurisdiction of the Lee County Board of Public Instruction.

Only business education teachers from the four high schools were included in the study. Full-time Distributive Education and Cooperative Education teachers were excluded as they are not included in the business education department in Lee County.

One hundred per cent response was received from the survey questionnaires. The information is limited, however, to the understanding of the questions asked and to the accuracy of the respondents' replies.

The in-service training program included in this study is not intended to be comprehensive. It would be impossible to include highly technical areas of systems analysis or a concentration of a specific programming language skill due to limited time available for in-service programs. The program will serve to introduce the business education teachers to electronic data processing and to cover concepts, applications, equipment, and skills in a broad rather than specific manner. Perhaps the most important objective in the teacher development program will be to lay a foundation for further self education in the field.

Definition of Terms Used

Automation

Automation is defined as the art or science of making a process more automatic. It is the implementation of processes by automatic means.

Data Processing

Data processing shall refer to the mechanical or electronic operation on data to achieve a desired result.

EDP

EDP pertains to the use of data processing equipment that is predominantly electronic such as an electronic digital computer.

Time Sharing

Time sharing is a processing system with a number of relatively low-speed, online simultaneously usable stations which allows several users to share the facilities of a computer system.

Optical Character Recognition--OCR

Optical character recognition is a data entry device that reads almost any kind of printed material.

Unit Record Equipment

A unit record is a record in which all data concerning each item in a transaction is punched into one card. Unit record equipment includes the following mechanical devices used in operations with punched cards: (1) keypunch (2) verifier (3) sorter (4) collator (5) interpreter (6) reproducer (7) accounting machine or tabulator.

CHAPTER II

REVIEW OF RELATED LITERATURE

Many persons agree that data processing education should be given in the secondary schools. A myriad of opinions exist, however, relating to the extent, purpose, and type of instruction that should be offered on the secondary level.

Need for Data Processing Instruction

General Education

Emphasizing the need for data processing as an integral part of the general education for all high school students, Murray Tondow[1] submitted the following in a memo to the school board in Palo Alto, California.

> We feel that this is perhaps the most important area of contribution. The computer sciences represent one of the most major scientific-technical-social revolutions that society is now experiencing. Irrespective of what one's role as an adult will be in our society, our students will need an understanding of what this computer revolution is about. We think it has as much meaning to the girl who will become a housewife as to someone who plans to go on to college, whether it be in the humanities or the sciences. Unless we provide our students

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[1]Murray Tondow, "An Evolving Philosophy and Approach," PIP Newsletter, I (November, 1963), 3.

> these opportunities we will not be meeting our responsibilities. Perhaps an important point to make here is that gaining technical competency in the sciences does not necessarily give the student an understanding of the social implications of this equipment.
>
> We are quite honestly not too clear as to how we might best proceed to accomplish this goal. We might think in terms of units in some of our social studies courses concerning the implications of the computer sciences to society. We would recommend that the most fruitful first step would be to work with our teachers through the usual curriculum channels and encourage them to suggest procedures by which we may accomplish our goal. Within ten years it will be as difficult for a person to fulfill his goal as a citizen without some knowledge of the computer sciences as it now is for an individual to exist in our society without an understanding of the automobile, what it is and has done, whether he drives one or not.

Robert Van Ness[1] categorizes students into three groups: (1) those who will directly enter the data processing profession, (2) those who will enter a profession related to data processing, and (3) those who will enter fields remote from data processing, but whose lives will certainly be influenced by it. It is difficult to conceive any student not belonging to at least one of these three groups. Certainly all students will be affected by the impact of computers on our society.

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[1]Robert G. Van Ness, How To Teach Data Processing (Elmhurst: The Business Press, 1969), 2.

In developing an introductory course in data processing, Speas[1] concludes:

> A definite need exists for a course in data processing for the secondary schools. Indeed it is necessary for the complete education of our youth to begin instruction in data processing on at least the secondary school level. . . . The subject matter is too broad to be given proper coverage in an already existing course, and the importance of the subject matter in our every day lives is too great to be given a back seat in the secondary school curriculum.

Goodlad, Toole, and Tyler[2] state "Computer training in higher education does not reach enough students. Every high school graduate should be exposed to some phase of EDP."

Enoch Haga,[3] a well-known authority and writer in the area of automation, reiterates:

> There is need for at least a one-semester and preferably a one-year high school course in automation and data processing; this course should be for all students, not just those in the business curricula. . . . Some understanding of an automated society should be as valuable to students as an appreciation of the workings of our economy, basic English, and simple mathematics.

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[1]Rita S. Speas, "The Development of an Introductory Course in Data Processing for Students of Secondary Schools" (unpublished M. S. thesis, University of Tennessee, 1965).

[2]John I. Goodlad, John F. Toole, Jr., Louise L. Tyler, Computers and Information Systems in Education (New York: Harcourt, Brace, and World, 1966), 82.

[3]Enoch J. Haga, "Automation and You," Journal of Business Education, XLII (May, 1967), 340.

James F. Weber[1] of Macomb County Community College, Warren, Michigan, writes:

> Most students enter college with only a vague grasp of what computers are and the kinds of things they do. This level of ignorance is shared by many levels in the community. Obviously, a general introductory course in computer concepts would be of value to every student. In addition to being part of a data processing curriculum such a course should also be offered as part of a continuing education program as a service to the entire community.

To sum up the contribution that data processing can make to the general education of all students, J. P. Maloney, Jr., concludes:

> Quite apart from specific computer skills, there is a growing awareness of the need to teach basic computer concepts--to remove the mystery of the computer. Children who are in school today will spend half their lives in the twenty-first century, when the computer will be as much a fact of daily existence as electricity and the automobile are today. Many experts fear that a computer gap is being created, separating the students of wealthier institutions which can afford this kind of broad computer education from students of the poorer ones--creating, in other words, a kind of computer aristocracy.[2]

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[1]James F. Weber, "Data Processing Education--Can Community Colleges Do the Job?" Business Education Forum, XXIII (April, 1969), 27.

[2]J. P. Maloney, Jr., "Electronic Data Processing in Education," Journal of Educational Data Processing, VI (Fall, 1969), 228.

Business Education

Dr. Gilbert Kahn, professor of Business Education at Montclair State College, Upper Montclair, New Jersey, lecturer and author of many publications in the field of data processing and other business areas, stated at the 1967 Eastern Business Teachers Association convention, "Leaving data processing out of the business education curriculum is like leaving typewriting out of that same curriculum."[1]

In a study of two graduating classes of a suburban comprehensive high school, graduates were asked what business education courses they wished they had taken.[2] Forty per cent indicated they would have liked to take a data processing course or a computer programming course, or both. Seven per cent, those who had participated in an experimental course in data processing or computer programming or both, indicated that they found these courses to be valuable to them after graduation. The graduates included in the study had been out of high school one or two years and included students who were in the labor market and those in college. Both groups indicated a desire and need for additional education in the area of data processing.

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[1]Marie J. Lynch, "Data Processing Is for Everyone," EBTA Journal, VI (Spring, 1968), 67.

[2]Janet Lee Baulch, "A Follow-Up Study of the 1965-66 Graduates of Poway High School" (unpublished M. S. thesis, San Diego State College, 1968).

To determine student opinion on the need for high schools to provide data processing instruction, Drew[1] surveyed the 1962 and 1963 graduates of Lodi Union High School in California. The sample selected was restricted to those students who had enrolled in two or more business education classes.

Questionnaires were mailed to 431 students (44.8 per cent of the student body). One hundred seven (26.7 per cent) questionnaires were returned. Fifty-four per cent indicated that since leaving high school they had felt a need for knowledge in the field of electronic data processing. The reasons most frequently cited for this need were: (1) applying for jobs, and (2) better general understanding of the principles of automation.

Extent of Data Processing Instruction In the High School

The research committee of Delta Pi Epsilon and the South-Western Publishing Company conducted cooperatively a study of data processing instruction in the high schools.[2] A postal card insert was included in the May, 1965, issue of The Balance Sheet and mailed to all business teachers.

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[1]William E. Drew, "A Unit of Instruction in Data Processing for Lodi Union High School" (Unpublished M. A. thesis, Sacramento State College, 1965).

[2]Fred S. Cook, "Status of Data Processing in American Secondary Schools," The Balance Sheet, XLVII (April, 1966), 348.

A total of 2,228 separate high schools responded representing approximately ten per cent of the 24,190 estimated secondary schools[1] in the United States.

In response to the question, "Does your high school offer any data processing instruction?" 719 (32.3 per cent) replied affirmatively. There were 590 schools giving less than one semester of keypunch training, while 97 had one semester, and 28 schools reported two semesters. One hundred twenty-eight schools had one semester in the principles of data processing; 25 schools had two semesters; nine schools reported three or more semesters for this course.

In the United States Office of Education research study, Bangs and Hillestad surveyed 9,484 of the estimated 29,403 high schools.[2] Eight per cent reported offering courses in data processing and 11 per cent indicated plans to initiate courses in the near future.

In January of 1969 Greene[3] mailed a questionnaire to each state supervisor of business and office education to determine the status of data processing instruction in

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[1]1961-1962 Digest of Educational Statistics

[2]F. Kendrick Bangs and Mildred C. Hillestad, Curricular Implications of Automated Data Processing for Educational Institutions, A United States Office of Education Research Study (University of Colorado, September, 1968), 191.

[3]Richard S. Greene, "The States Report," Business Education World, XXIV (October, 1969), 26.

educational institutions. As of July, 1969, 34 of the questionnaires were returned. General findings concerning the high school programs were:

1. Twenty-five states offered data processing courses without the use of equipment. Some schools integrated these materials with other business courses.

2. Twenty-seven states offered data processing courses involving the use of unit-record equipment only.

3. Four states offered data processing courses with the use of computers only.

4. Fifteen states offered data processing courses using both unit-record equipment and computers. Courses ranged from one semester to three-year programs.

5. The most popular computer languages taught appeared to be COBOL, FORTRAN, AUTOCODER, EASYCODER, and RPG.

State directors made the following comments in regard to future trends in their data processing instructional programs:[1]

1. The need for teachers of data processing is so great that summer workshops and other college offerings are being initiated.

2. Consideration is being given to a total systems approach to data processing involving not only business education but also mathematics, science and school administration.

3. Time-sharing methods using remote terminals to large computers are being used.

4. Plans are being made to expand computer training in schools previously equipped with unit-record equipment.

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[1] Ibid.

5. Introduction to programming is offered to high school students using software rather than hardware.

6. There is a phasing out of unit-record equipment and instruction and addition of programs in computer programming.

7. Computer "hands on" experience is to be offered at the high school level.

8. As the use of computer services comes within the reach of more businesses, the demand for data processing programs in high schools will become greater.

9. Keypunch training will remain, with less emphasis on unit-record board wiring and more introduction to sophisticated computer languages such as COBOL and RPG.

10. Mobile units to house unit-record laboratories are being used in some states.

11. There is a gradual conversion from card punch to key tape machine training.

12. Basic data processing is offered as a semester course in the eleventh grade with a full-year course at the senior level to teach programming.

13. There is a need for continued funding through the various vocational acts.

14. There is a need to encourage cooperative work experience programs.

15. Advisory committees should be used to determine the type of offerings in data processing and to determine the availability of jobs.

A survey sponsored by the Massachusetts Business Education Directors Association between October, 1967, and December, 1967, of 250 high schools in the Commonwealth of

Massachusetts revealed that only one high school was offering a complete two-year program for both business and college-bound students. Eighty-six of the 125 schools responding were teaching data processing concepts integrated in other areas or as semester courses.[1]

In a study restricted to the public high schools of the northern 21 counties of Illinois to determine the status of data processing instruction, Hallstrom's findings were:[2]

1. Data processing courses were offered in 15.58 per cent of the schools.
2. Of the schools which offered courses, 80.65 per cent had equipment, with keypunch machines available in greatest quantity.
3. The majority of courses were offered in the eleventh and twelfth grades.
4. Textbooks were listed as the basic instructional material for approximately one-third of the units and practice sets for approximately one-fourth of the units.
5. At least one unit of data processing instruction was included in 68.34 per cent of the schools.

Nature of Data Processing Instruction In the High School

More divergent views exist regarding the nature of data processing instruction in the high schools than in any

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[1]Lynch, "Data Processing Is for Everyone," 70.

[2]Elva Gustafson Hallstrom, "A Study to Determine the Status of Data Processing Courses and/or Units of Instruction in the Business Education Curricula of Public High Schools of the Northern 21 Counties of Illinois" (unpublished M. S. thesis, Northern Illinois University, 1968).

other area of data processing on the secondary level. The development of a curriculum to keep pace with rapidly expanding technology requires an insight into the attitudes of educators, computer manufacturers, and management. Merle Wood expresses concern that "a basic tool such as the community survey has not been more fully employed in connection with the development of data processing programs."[1]

For purposes of this study, further review of literature relating to the nature of the data processing instructional program will be divided into two sections: surveys and professional opinions.

Surveys

Jones[2] surveyed 69 digital computer installations in Ohio to determine the knowledges and skills needed by the high school graduate for employment in computer installations in business. Significant findings were:

1. Twenty-seven first-level entry occupations for which the high school graduate can qualify were found.

2. Opportunities exist for employment as a keypunch operator and tabulating machine operator in enterprises of all sizes.

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[1]Merle W. Wood, "High School Business Data Processing Curriculum Development," Automated Educational Systems, ed. by Enoch Haga (Elmhurst: The Business Press, 1967), 271.

[2]Dorothy Seitz Jones, "A Survey to Determine the Knowledges and Skills Needed by Clerical Workers in First-Level Entry Occupations in Digital Computer Installations" (unpublished Ph. D. dissertation, Ohio State University, 1964).

3. Training for employment in first-level entry occupations should include getting along with people; performing work according to a schedule; typewriting; clerical recordkeeping; bookkeeping; handling source documents; preparation of flow charts and block diagrams; familiarization with tabulating and computer equipment; principles of programming and coding; filing; including punched cards, magnetic tape, and paper tape.

4. Because of the characteristics of the rapidly developing computer technology, the type of education or training program needed in the high school is one that will provide the student with flexibility; emphasize to him the need for continuing education; and inform him of the occupations which exist.

Gibson[1] interviewed heads of data processing installations in 103 businesses located in the greater Boston area. Recommendations concerning the high school curriculum in the order of the frequency in which they were mentioned were:

1. Give a general data processing orientation course for everyone.

2. Stress general education.

3. Teach keypunching and programming.

4. Concentrate on mathematics and logic.

5. Stress philosophy of data processing and concepts of business systems.

6. Stress the importance of reliability and accurate work habits.

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[1]Gertrude Gibson, "A Study of Office Automation in Selected Business Firms of the Greater Boston Area with Implications for Curriculum Planning" (unpublished Ed. D. dissertation, Boston University, 1968).

Ninety-six business educators who were members of the Chicago Business Education Department Chairmen Association and 104 businessmen who were members of the Chicago Data Processing Management Association were queried concerning the content of an introductory course in data processing.[1] Questionnaires were completed by 58 business educators and 42 businessmen resulting in the following conclusions:

1. All indicated that an introductory course in data processing should be offered at the secondary level.

2. Businessmen are willing to hire high school students to work in their data processing departments.

3. A basic understanding of the punched card and the functions and capabilities of the key-punch, sorter, and collator is necessary.

4. Business educators and businessmen would prefer students to have "hands on" experience with data processing equipment.

Twenty-one firms in the Pekin-Peoria, Illinois, area participated in a survey of clerical employees in data processing occupations.[2] The businessmen constituted a representative sample of large, medium, and small firms

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[1]Marvin Dale Manning, "A Survey of the Opinions of Businessmen and Business Educators in the Chicago and Metropolitan Area Concerning the Content of an Introductory Course in the Secondary School in Data Processing with a Resultant Course Outline" (unpublished M. S. thesis, Northern Illinois University, 1968).

[2]Carolyn Godby, "Clerical Employees in Data Processing Occupations," The Balance Sheet, XLVII (October, 1966), 60.

in the areas of manufacturing, wholesaling, retailing, service and finance. The types of jobs included: keypunch operator, card to tape converter operator, coding clerk, data typist, high-speed printer operator, tabulating record control clerk, chief tape librarian, teletype and flexowriter operators. All employers said that a high school education is adequate for these jobs. The business employers were in general agreement that there is a definite need for training data processing workers in the high schools prior to their actual placement on the job.

In a survey of Minnesota businesses, Andersen[1] found that high school students may secure positions as keypunch operators and verifier operators, tabulator equipment operator, console operator, programmer, card method analyst, or computer operator without additional training in data processing.

Kovach received 87 usable questionnaires from an initial mailing to 205 firms listed as members of the Data Processing Management Association in Saint Louis.[2]

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[1]Mary Jane Andersen, "Integrating Office Automation Knowledge into High School Business Education" (unpublished M. S. thesis, Mankato State College, 1965).

[2]Sharron Kovach, "Opportunities for High School Graduates in Data Processing Positions in Selected Business Firms in the Saint Louis area" (unpublished M. S. thesis, Southern Illinois University, 1968).

A summary of respondents' replies indicated:

1. The highest educational level required for keypunch operators, tabulating machine operators, tape librarians, and other clerical workers was high school completion.

2. The majority of respondents required only a high school education for console and computer operators, programmers, and control clerks; while in the area of systems and management, less than 50 per cent required only high school completion.

3. All jobs except tape librarian, control clerk, and miscellaneous clerical positions required training before hiring.

4. In all occupations except system analyst, the majority of respondents had no preference for any particular training institution when asked to choose between high schools, private business colleges, manufacturers' schools and colleges.

5. To instill the necessary attributes in potential employees, employers felt the high school training most useful would be data processing concepts and theory, mathematics, communication skills, general business subjects, bookkeeping, machine operation, and personal traits of dependability, logic, honesty, initiative, and flexibility.

6. Eighty-seven per cent of those responding stated that, if possible, their policy was to promote to higher level positions from personnel already employed in the company.

7. Ninety-two per cent said that advancement was possible from entry-level jobs into management or supervisory positions.

Hoehn[1] surveyed the training and languages of programmers and systems analysts in selected computer installations of Western Pennsylvania, Southern New York and Eastern Ohio. One hundred sixty-three companies with computer installations participated in the study. Significant among her findings were:

1. Most of the large companies were not willing to project their requirements for programmers or systems analysts for the immediate future.
2. Three-fourths of the companies found the training of private electronic data processing schools inadequate.
3. The vast majority of the companies had a hiring policy which preferred data processing training.
4. The majority of systems analysts (62.6 per cent) had college degrees.
5. COBOL was the computer language known by the largest number of programmers, 63 per cent.
6. The majority, 82.9 per cent of companies, indicated they would hire a programmer who knew only COBOL.
7. Almost 57 per cent of the computer programmers had less than a bachelor's degree as their highest level of academic training.
8. COBOL was recommended by 61.4 per cent of the companies as a training language for teaching computer programming at the high school level.

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[1]Elizabeth Hoehn, "A Survey of Training and Languages of Programmers and Systems Analysts in Selected Computer Installations of Western Pennsylvania, Southern New York, and Eastern Ohio" (unpublished M. Ed. thesis, Indiana University of Pennsylvania, 1969).

In a study conducted by LaSalle,[1] 33 business educators, 69 secondary school business educators, 69 secondary school department chairmen, 20 producers, and 99 users of automated data processing equipment throughout the United States were contacted. Questionnaires and personal interviews were utilized in acquiring data for the study. LaSalle's primary purpose was the analysis of the role of the secondary school business education department in preparing students for employment in business offices using automated data processing equipment. Results of the study were:

1. Ninety-six per cent felt that preparation for employment in business offices using automated data processing equipment should be one of the objectives of the business education programs in the secondary schools.

2. Ninety-five per cent of the producers and 85 per cent of the users recommended that business education departments should offer a course devoted to a study of automation.

3. A majority of the respondents favored a required one-year course on automation to be offered in the senior year. Subject matter should emphasize the types of automated equipment available, employment opportunities in the field, and the operation of automated equipment.

4. A majority indicated that a unit in one of the existing business education courses should be devoted specifically to automation, if a separate course is not offered.

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[1]James F. LaSalle, "The Role of the Secondary School Business Education Department in Preparing Students for Employment in Business Offices using Automated Data Processing Equipment" (unpublished Ed. D. dissertation, Shippensburg State College, 1964).

5. Seventy-six per cent of the business educators and 87 per cent of the secondary school respondents recommended offering instruction on keypunch equipment. Seventy-one per cent of respondents favored including instruction on collators, and 75 per cent favored including instruction on accounting machines.

6. Business offices used well-recognized general and clerical tests as one of the criteria for selecting personnel to work with automated data processing equipment.

Hanke[1] developed two questionnaires--one for computer programmers to determine their educational background, and one for employers of programmers to indicate their hiring policies in regard to experience, education, and aptitude tests required of programmer applicants.

Questionnaires were sent to members of the Data Processing Management Association. One hundred twenty-three usable replies were received from the programmers and 100 usable replies were received from employers of programmers. Hanke's findings are summarized below:

1. The majority (80 per cent) of the responding programmers had completed some college education. This fact did not correspond with the requirements of employers who, in nearly half the responses, indicated that no college education was necessary.

2. Over one-half of the programmers responding did not receive a bachelor's degree.

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[1]John Edward Hanke, "A Study of the Education and Training of Business Computer Programmers in Selected Businesses in Northern Illinois" (unpublished M. S. thesis, Northern Illinois University, 1964).

3. Logic was ranked first by business programmers as the course most necessary for the preparation of programmers.

4. Although most firms indicated programming experience or a college education was desirable, findings indicated that most firms do not require such training.

5. It appears that on-the-job, in-service company training, colleges, and equipment manufacturers respectively are the best sources for preparing business programmers.

6. Three-fourths of the business programmers now employed were trained by their present employers or had training with some other firm.

7. Aptitude tests are being used extensively as indicated by 77 per cent of the responding firms.

8. Over one-half the firms have in-service training programs for programmers.

Brown's[1] study attempted to discover whether or not there were sufficient opportunities in data processing in the Detroit metropolitan area to warrant vocational training in high school business education programs. Based on the results of 104 interviews with businessmen, Brown concluded the following:

1. More than 60 per cent of all persons employed in data processing were found to be keypunch operators or tabulating machine operators.

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[1]Daniel P. Brown, "A Status Study of Detroit, Michigan, Automatic Data Processing Installations with Implications for Business Education" (unpublished M. Ed. thesis, Wayne State University, 1965).

2. The majority of employers will accept a high school education from a keypunch operator, machine operator or computer operator. One-third of the employers will accept a high school diploma for jobs beyond these.

3. The programmers trained in high school or college were as acceptable to these employers as manufacturer-trained programmers.

Brown's survey also revealed that of the 104 interviews, 39.4 per cent of all respondents had plans to phase out their tabulating equipment within the next two years.

There is much controversy as to whether new data entry devices may replace unit-record equipment operators. Guimont[1] attempted to determine the impact optical character recognition machines are making on the keypunch and verifier occupations. Eighty-two companies with OCR installations were asked to participate. Sixty-seven data processing managers responded to the questionnaire representing an 81.7 per cent return. An analysis of replies revealed the following:

1. Ninety-one per cent of the data processing installations surveyed maintained a keypunch department prior to installing OCR equipment. After OCR equipment was installed, 98 per cent were still maintaining keypunch departments.

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[1]Dale W. Guimont, "What Effect Will OCR Equipment Have on Keypunch and Verifier Operations?" Business Education Forum, XXIV (December, 1969), 29.

2. Fifty-seven per cent of the installations that maintained a keypunch department after OCR equipment was installed said their keypunch department increased or remained relatively the same.

3. The keypunch departments that decreased in size because of OCR equipment accounted for 958 displaced keypunch or verifier operators.

4. Forty-per cent of the displaced keypunch or verifier operators remained with the company and served in the data processing field in some other capacity. The majority of these people obtained jobs as OCR typists.

5. Approximately 30 per cent of the displaced workers chose to obtain employment elsewhere.

6. Of the firms that continued to maintain a keypunch department, 65 per cent felt that economy and practicability were the principal reasons for doing so.

7. Thirty-five of 56 OCR managers (63 per cent) said that they would employ more or about the same number of keypunch or verifier operators for the next five years.

8. Seventy-nine per cent of the data processing managers considered a knowledge of data processing fundamentals as the most important skill for OCR equipment operators.

Caroline Beckner was one of 14 interviewers who took part in the University of Colorado's research project, "Curricular Implications of Automated Data Processing for Educational Institutions," financed by the United States Office of Education. The following are some of the comments she received from businessmen in regard to data processing employees.

> Industry isn't worried about machine operators. The mechanics can be taught in a few weeks through on-the-job training. What we do need is people who can think.
>
> We want people who have had experience in our field, whether it's insurance, textiles, banking, or whatever. We'll teach them the data processing, but first they should be able to understand our kind of business. A general education followed by specific application is best.[1]

A survey was conducted cooperatively by the Charlotte-Mecklenburg school system and the Charlotte Chamber of Commerce in North Carolina to determine the content of the data processing curriculum in the schools.[2] Eight hundred business firms were selected to participate. Returns were received from 40 per cent of the total mailing list. Of the 320 responses, 101 companies had data processing equipment and 219 firms did not. Significant findings were:

1. Of the firms responding which do not have data processing equipment, 19 per cent plan to acquire data processing services in the near future, and 16 per cent plan to install equipment in the next five years.

2. Of the 101 firms that have equipment, 63 per cent have computer installations. Thirty-seven per cent have unit-record installations and half of these plan to update with a computer installation within the next two years.

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[1]Caroline Beckner, "Who Should Study Data Processing," Business Education World, XXXXVIII (April, 1968), 10.

[2]John M. Bunch, "Survey Shows Need for Data Processing Instruction," Business Education Forum, XXIII (March, 1969), 24.

3. Firms with data processing equipment had 678 keypunch positions and 1,077 programming staff members.

4. Fifty-five per cent of the firms indicated they train their own keypunch operators, but 95 per cent believe the public schools should train computer operators.

5. Ninety-one per cent want public schools to train students in the basic concepts of programming for vocational purposes; however, only 60 per cent felt that unit-record board wiring should be taught in the public schools.

6. A shortage of data processing workers was noted by 76 per cent of the firms. The greatest shortage in rank order appears to be for programmers, keypunch operators, and machine operators.

7. Of the 65 business firms that already have a programming staff, 55 per cent indicated that they plan to increase this staff soon.

8. The programming languages most recommended for teaching in the public schools were COBOL and FORTRAN.

9. Of the responding firms, 82 per cent indicated they would be willing to interview a well informed graduate in the field of data processing for possible employment.

Professional Opinions

Dr. E. Dana Gibson, executive secretary of the Society of Data Educators and professor of information systems management at San Diego State College, feels that equipment is a major factor affecting the teaching of high school data processing. High schools are either obtaining computer equipment or going on-line to a data processing service center. Some high schools have punched card equipment but no computer. Limits are placed on vocational data processing training in direct proportion to the equipment that is available. Dr. Gibson writes:

> High schools should probably train most vocational, entrance data processing workers. This puts the responsibility of developing the skills needed to handle the equipment needed for computer operation. Graduates will not immediately be able to obtain top skill jobs in operating this equipment, but they can work up to such positions.
>
> This trend and earlier recommendation mean that the high school cannot go 100 per cent toward on-line operation--they must have equipment upon which to teach the vocational skills needed.[1]

Clair Parsh feels that the high school's responsibility for data processing should be on an orientation level. "The primary objective of the high school should be to acquaint

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[1]E. Dana Gibson, "Methods and Techniques for Integrating Data Processing Concepts into High School Business Courses," (San Diego: SDE Press, 1969), p. 7.

the student with the many aspects of data processing. This acquaintanceship should be designed to clear up some of the misunderstandings about automation and data processing, present the terminology that is used in the field, and give the student an overview of the field of data processing."[1]

Merle Wood, former supervisor of business education for the Des Moines Public School System and present supervisor of business education for Oakland City Schools, Oakland, California, states:

> Some well-meaning voices have suggested that we should not train people for certain types of jobs in the data processing field. This caution has particularly referred to the lower-level jobs, such as keypunch operator and punched card machine operator. The reason for this attitude is that, because of rapid advances in the development of new kinds of equipment, many of the lower-level jobs will be eliminated. . . . Five years ago there was concern that keypunching was 'on its way out.' Today there are still shortages of keypunch operators in many sections of the country. We need to concern ourselves with training our students for current job needs, and we need to keep sufficiently aware of data processing trends so we can shift our production of vocationally competent graduates to new skills as they are needed by our businesses.[2]

The following are excerpts of an editorial appearing in the February, 1964, edition of Datamation[3]:

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[1]Clair R. Parsh, "Data Processing Education," Journal of Business Education, XLIII (December, 1967), 111.

[2]Wood, "High School Business Data Processing Curriculum Development," 278.

[3]Wanted: Super-Specialists, Datamation, February, 1964, 28.

Despite a continuing cacophony of complaints about hardware, people remain the biggest problem in information processing. Computers are meant to be used by people, after all, although this is not always apparent. Which is perhaps the clearest indication that they are designed by humans.

The people problem takes many forms--from machines which don't do what they are supposed, or promised to do . . . to the inability to use hardware and software intelligently. In nearly every case, the cry goes out for more and better trained people.

Since experienced computer people are not manufactured overnight, attention turns to something called education. Certificate programs are created, programmed instruction is tried . . . high schools, trade schools, and universities develop special curricula.

We have no quarrel with honest attempts to upgrade people, to help them grow, get more savvy. But we feel that perhaps what has passed for education could be better called training; the development or enhancement of technical skills to meet today's technical problems.

But we'd like to suggest that the really big problems are not primarily technical . . . and that they are not today's but tomorrow's. This is another way of saying that what we need is not so much specialists as . . . well, let's call them generalists or superspecialists; people capable of understanding (and communicating intelligibly about) a problem in its broadest perspective totality . . . able to foresee the implications of a problem and its solution, able to evaluate and direct the work of specialists.

> We're not pretending to know how such people can be found or developed. But perhaps education (as distinguished from training) holds a clue. This kind of education develops the abilities to think critically and creatively, to grasp the fundamental tools of analysis--in English, statistics, and math--to distinguish between large and small, critical and petty probems . . . and to communicate clearly.
>
> Perhaps one of the greatest strengths of the computer industry so far is that it has attracted from an amazing variety of disciplines a wild assortment of bright, interesting, creative people. Maybe we need more of this kind of person, rather than icely homogenized products of a standard training system.

Herbert Tonne, lecturer and author of business education textbooks, refers to the data processing curriculum in this manner:

> In one large school system a small number of able students are syphoned off the general program and give half their time for the last three years of their secondary high-school program to a complete survey of data processing. Will these segregated students have equal opportunity to get into colleges of their choice as compared to equally gifted students who have taken a regular program?[1]

Tonne feels that high school is meager general preparation for the data processing field and the junior college level should be the earliest for job training in data processing.[2]

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[1]Herbert A. Tonne, "Data Processing Instruction in High School," Journal of Business Education, XXXX (October, 1964), 9.

[2]Herbert A. Tonne, "Job Training in the High School," Journal of Business Education, XXXX (November, 1964), 51.

Ambre[1] quotes George Heller as stressing the need for emphasis on the basic concepts in the development of the program sponsored by the Association for Computing Machinery in the Washington, D. C. area. Heller says there is no point in merely training students to use the tools in a rapidly developing field as EDP. The equipment is bound to change, but the basic concepts and principles underlying this new technology will always be applicable.

In preparing an orientation course in data processing, Wenner[2] interviewed the supervisors of business education in Des Moines and Cedar Rapids, Iowa. He concluded that the program at Des Moines[3] is not the most appropriate for these reasons:

> First, it does not seem appropriate for a high school student to spend one-third of his sophomore year and one-half of the junior and senior years taking data processing and related courses at the expense of other high school courses. Students who follow this program and later decide to go on to college in any of the fields of science or engineering will have missed several of the basic high school courses that are a necessary part of the background for these college programs.

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[1]Ago Ambre, "Breakthrough in High School Computer Education," Occupational Outlook Quarterly, IV (December, 1962).

[2]James F. Wenner, A High School Orientation Course in Data Processing, Monograph 114 (Chicago: South-Western Publishing Company, 1966), 70.

[3]The Des Moines data processing instructional program is reviewed in the next chapter.

> Secondly, this author is not convinced that programmers can be effectively educated and trained at the high school level; that is, this author believes it would be much easier to train programmers than it would be to train accountants, mathematicians, or scientists. Students who have gone through this program do not have the background in accounting, mathematics, or science to write programs in these fields. Consequently, students who are spending a large part of their high school years learning programming are, at the very same time, missing courses that would give them some of the necessary background to a program in data processing.

Charles Silberman's article in Fortune[1] emphasizes what educators should strive for to achieve excellence in the school curriculum:

> Much of the knowledge today's students will need hasn't been discovered yet, and much of what is now being taught is (or may soon become) obsolete or irrelevant.
>
> What students need most, therefore, is not more information but greater depth of understanding, and greater ability to apply that understanding to new situations as they arise. 'A merely well-informed man,' that greatest of modern philosophers, the late Alfred North Whitehead, wrote forty-odd years ago, 'is the most useless bore on God's earth.' Hence the aim of education must be 'the acquisition of the art of the utilization of knowledge.'

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[1]Charles E. Silberman, "Technology is Knocking at the Schoolhouse Door," Fortune, LXXIV (August, 1966), 123.

Projected Developments in Data Processing

To plan realistically for the education of students for entry-level skills in data processing and the pursuit of higher education in this area, it is necessary to gain insight into the future of data processing. In Bangs and Hillestad's United States Office of Education research project, interviews were held with computer manufacturer executives and data processing managers to discover any changes that are anticipated in the next three to ten years. The following opinions are taken from this study:

Opinions of Advance Planning Executives[1]

Interviews were held with the vice presidents in charge of advance planning for the following computer manufacturers:

1. Burroughs Corporation
2. Clary Company
3. Control Data Corporation
4. Digital Equipment Corporation
5. Friden, Inc.
6. Honeywell
7. International Business Machines Corporation
8. Monroe International, Inc.
9. The National Cash Register Company
10. Philco Corporation
11. Radio Corporation of America
12. SCM Corporation
13. UNIVAC, Sperry Rand Corporation

In addition, an interview was held with a representative of the Diebold Group, Inc., because of the extensive research and writing this group has done in the field of data processing.

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[1]Bangs and Hillestad, Curricular Implications for Automated Data Processing in Educational Institutions, 65-69.

The interviews were designed to discover plans for technological changes in hardware and software likely to come about in the next three to ten years that might have an effect on the education offered to future data processing employees.

The executives generally agreed regarding developments in data processing during the next three to ten years. Following is a summary of those areas of agreement:

1. Miniaturization of computers has and will reduce the cost of computers, so a greater number of even relatively small businesses will be able to afford electronic data processing in some form more than in the past.

2. Computers will have more memory capacity than in the past at less cost per bit. This will enlarge the applications that can be made on the computer, thereby permitting more effective usage of the computer.

3. Enlarged memory units will result in reduction in the need for exactness in programming (the programmer need not be as sophisticated), thus reducing the amount of training required of a programmer. Consequently, the programmer may be trained at the post high school level in the future rather than requiring him to have a college degree.

4. Advancements in the next few years will take place more in the software rather than in the computer. The computer is not used to maximum efficiency today because of the slowness of input devices. Many new advances will take place in the input and output devices of the computer.

5. The use of the punch card as an input device will diminish. This will result in a reduction in the proportion of persons needed to operate keypunch machines with the actual number of operators remaining at about the same as the present number of operators. Other devices will be developed and used as input devices that will be more speedy and acceptable for the mass of data to be processed. (All computer manufacturers were of this belief, except one. Since the interviews, the exception has published a study, the results of which agree with the statement that the punched card may not continue as the major input device.)

6. Programmers need to have a logical mind, not mathematical training per se. Generally, the thought has been that the programmer should be highly mathematically oriented; however, algebra seems to be the extent of mathematics background required for business data processing.

7. A trend seems to be developing toward the necessity for the programmer to be an analyst in addition to his being able to program. This would indicate that the programmer will need to continue his training beyond a post high school program to hold and advance in his job as a programmer. A good programmer will likely become a systems analyst in six months to a year.

8. Hands-on training is probably more important psychologically to the prospective computer operator rather than for its actual learning value.

9. Data processing instruction should not be based on just one particular machine. Operators must be able to move from one make of machine to the other.

10. As optical scanning becomes more prevalent, the need for persons for the job of coding will diminish.

11. Time sharing (through service bureaus and computer service utilities) will increase. For the smaller companies, the input/output devices will be in their offices, giving access to a large processor at some other location. Operation of the input/output devices will be performed by regular employees of the small firm.

12. Low-cost remote terminals will be available soon.

13. Video data terminals are probably the greatest development thus far. These are presently technically operable, and will be reduced in cost during the next three to ten years, making them practical for business usage.

14. Machine languages will give way to the higher level languages such as COBOL.

15. Data processing personnel need to know and understand systems as they relate to the interrelation of all the functions of business.

16. Understanding data processing applications is of more importance than understanding of the computer itself.

17. Unit record equipment is being replaced with computer installations. Unit record equipment will be gradually phased out.

18. The educational system needs to take over the training for data processing. It is not necessary to train on specific hardware; students should be trained with equipment independence.

19. Information will be more commonly fed into the computer using a language form rather than machine language.

20. Data processing employees must be communications oriented.

21. Computer design will change with increased emphasis on making them failsafe. One function may be taken over by another device in the system while the other is being fixed.

22. The wiring concept is decreasing. Programming will be internal with the machine.

Opinions of Managers of Data Processing Departments

The responses of the data processing managers to the question, "What changes in data processing do you see in the next three to five years?" were quite similar to those of the computer manufacturers. The following statements summarize the thinking of data processing managers regarding the future of data processing:

1. Improvement of input/output media and devices is necessary. The computer is too fast for the input/output equipment now being used, and these media and devices must be improved in the very near future.

2. Teleprocessing and other data communications media and devices will be used much more widely in the future.

3. The cost of data processing equipment will decrease, making it possible for more and more companies to use electronic data processing in their businesses.

4. Because of increasing application of real-time and time-sharing equipment, faster core speed for computer and faster input/output media and devices will be developed.

5. The growth in time-sharing and service bureaus, even by companies with data processing installations, will be phenomenal.

6. The use of random access and mass memory for real-time processing will become very prominent in the near future.

7. Because of the newer techniques and newer equipment being installed in the businesses, the upgrading of present employees in business will be a definite trend.

8. Programming languages will be simplified.

9. Unit record equipment is being de-emphasized more and more in business and will continue to be so in the next few years.

10. More sophisticated use will be made of the computer. Instead of using the computer simply to process accounting work, the machine will be used to aid management's decision-making activities.

11. One trend about which nearly total agreement was evident was that the extreme shortage of skilled data processing personnel would continue, especially for programmers and systems analysts.

12. Software packages prepared by the manufacturer will be continually improved.

When asked what changes in their data processing they were contemplating in the next three to five years, the data processing managers suggested these:

1. The IBM 360 (models 30 and larger) will be used very extensively by a majority of the companies.

2. More and more applications will be placed on the data processing equipment.

3. Additional personnel will be added.

4. More 'sophisticated' use will be made of the equipment.

5. Nearly all data processing managers indicated plans for use of either time-sharing or of random access and real-time concepts.

6. Wider use of data communications were being made and would continue to be made.

7. Re-education and upgrading of employees will take place, with particular emphasis on systems personnel.

8. A definite move toward centralization of a company's data processing is being planned for those companies spread geographically over a wide area.

9. The change to Report Program Generator or PL-1 programming is being planned.

10. Managers indicated the need to change or revamp their entire systems to be more compatible with the newer third generation equipment.

Summary

Data processing education is an integral part of the general education for all students. All students regardless of their career objectives will be affected by the impact of computers. Since high school represents the terminal education for the majority of our youth, it is imperative that data processing instruction be provided in the secondary schools.

The importance of computer concepts warrants a full year course in the high school curriculum. The subject matter is too broad to be incorporated into an already existing course. On the other hand, the data processing curriculum should not be so extensive that other courses vital to advanced studies in data processing are sacrificed.

There continues to be a shortage of personnel in this area, and businessmen are looking to the high schools as a major source of EDP personnel. High school graduates may obtain positions as keypunch and verifier operators, tabulating equipment operators, tape librarians, and card-to-tape converter operators. Additional education is required for programmers and, generally, a college degree is necessary for systems analysts.

Vocational data processing instruction will be limited to the equipment that is available. The basic concepts of data processing, however, can be taught without equipment; and the mechanics of machine operation can be learned in a relatively short time through on-the-job training.

CHAPTER III

REVIEW OF SELECTED PROGRAMS IN DATA PROCESSING

Many good ideas can be gained from successful programs in other schools. No two situations are alike; however, and the data processing instructional program must be developed for the students and community it will serve. The development and implementation of a data processing curriculum is the responsibility of the teacher and school administration. Observations of other programs should not preclude a thorough investigation of community and student needs.

This chapter surveys the data processing curricula of two high schools and one junior college. Edison Junior College is located in Fort Myers (Lee County), Florida, and the data processing instructional program is relevant to the recommendations for the data processing curriculum in the high schools of Lee County.

Des Moines Public Schools

The Des Moines Public Schools, Des Moines, Iowa, offer one of the most comprehensive vocational data processing

curricula in the nation. Funds for the operation of this program come from three sources. The Federal Government, under the National Defense Education Act, provides 50 per cent; the state government provides 25 per cent, and the local school district, 25 per cent.

Equipment includes a Burroughs B260 computer system and IBM and Remington Rand peripheral equipment. Three separate curricula are provided: Keypunch Operator, Tab Equipment Operator, and Computer Programmer.

Merle Wood was supervisor of business education and coordinator of the vocational data processing program in Des Moines during the planning and implementation of the data processing curricula. Mr. Wood[1] describes the course offerings in each of the three curricula:

Course Descriptions

I. Keypunch Operator

> Students who have a typing rate of 40 wpm and pass the qualifying examination may elect to take the Keypunch Operator course. Enrollment will be limited by the number of machines available for training purposes. While any student may enroll, preference will be given to upper classmen.

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[1] Enoch Haga, Understanding Automation (Elmhurst: The Business Press, 1965), 110.

Keypunch KP1 ¼ unit

This is a complete course in keypunch operation. Drills and practice problems help to develop a high degree of skill.

Introduction to Unit Record Equipment KP2* ¼ unit

This is a survey course. It shows how the keypunch function fits into the entire unit record process. Instruction and practical exercises on the other units of equipment in the tab operation prepare the keypunch operator for advancement to other jobs.

II. Tab Equipment Operator

Students in this program must have a grade average of three and pass a qualifying examination. The course may be taken by eleventh and twelfth grade students.

Tab Equipment I TE1 ½ unit

Instruction is provided on all phases of unit record equipment from keypunch through printing machines. Board wiring fundamentals are taught. Practice problems provide actual experience in machine operation.

Tab Equipment II TE2 ½ unit

This is a continuation of Tab Equipment I. It provides for more instruction in machine operation and more complex wiring practice. At the completion of this course, students will have had experience on keypunch machines, the verifier, collator, sorter, interpreter, and the accounting machine. Systems development and valuations are included.

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*May be taken as general elective.

Introduction to Computers TE3 ½ unit

Students who have completed the initial two semesters of Tab Equipment Operation will be introduced to the computer field. This survey course provides information as to types and functions of computers. It will also prepare many tab equipment operators to eventually work into computer operations. The background provided by this course will show the relationship between unit record equipment and the computer.

III. Computer Programmer*

Because of the complexity of the study in this six-semester program, only students who have maintained a grade average of two and pass the qualifying examination will be eligible to enroll. They must have had algebra one and two. The one year science requirement must either be met in ninth grade, summer school or as an elective during high school.

Tenth Grade

Computer Programmer 1 CP1 1 unit

Accounting

The necessary background in the principles of accounting is presented. After a thorough discussion of the accounting functions, the student is introduced to the data processing machines concept used in actual accounting practice.

Business Organization

This course starts out with the organization of a business, presents the actual problems of starting the business, and then progresses through the various problems of operating a business. Emphasis is included from both the worker's point of view and the manager's point of view. In this way,

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*Students attend class three consecutive periods (3 hours per day).

the future worker learns the viewpoint of the manager, and the future manager learns the viewpoint of the employee. The course will include the discussion of American business; business organization; starting a business; purchasing; merchandising and production; financial operations of business; management and personnel problems problems; government and business; and survival problems of business.

Electro Mechanical Machines and Typing

This course provides an introductory look at unit record equipment used in a data processing operation. The relationship of this equipment to the computer is emphasized. Students are exposed to planning, programming, and wiring as related to punched card equipment. Also included is a personal typing course which will develop within the student the ability to touch type. Emphasis is on good technique. Skill in simple letter forms and report forms is developed.

Computer Programmer II CP2 1 unit

Basic Computing Machines

This course illustrates the development of computer systems from manual methods to the stored program. It provides an overview of the entire range of computers and computer systems. It covers the development of data processing, computer characteristics, input-output media and programming techniques.

Accounting II

Real business situations are used to show the application of computing equipment to various types of problems. Through these exercises, the students gain an understanding of the advantage afforded by combining machines and systems. Applications are made to accounts receivable, accounts payable, payroll and inventory control.

Electro Mechanical Machines

Continuation of Electro Mechanical Machines and Typing from Computer Programmer I.

Eleventh Grade

Computer Programmer III — 1 unit

System Development and Design 1

This course guides the student through the three stages of evolution of a statement, the analysis of present information flow (including forms design and job timing), system specifications and equipment selection and implementation of the system.

Computer Programming 1

Computer programming 1 presents the student with the basic tools and materials needed to become a programmer. Programming drills and case studies are presented in order to show the student how the classroom theory is applied to the business world.

Computer Programmer IV — 1 unit

System Development and Design 2

Continuation of System Development and Design 1 from Computer Programmer III.

Computer Programming 2

This is a continuation of Computer Programming 1 and deals with advanced programming techniques and symbolic programming. This course has a heavy emphasis on advanced program writing, machine testing and detailed flowcharting.

Human Relations

Instruction in solutions of personnel problems, principles of human relations, employer-employee

relations and development of the individual personality make this course one of interest and importance.

Twelfth Grade

Computer Programmer V 1 unit

Management Accounting

Information is provided on the use of accounting information in the management of business. Budgets planning and control, statements and machine applications to cost accounting are explored.

Advanced Computing and Programming Systems

The objective of this course is to provide the student with sufficient knowledge of programming systems concepts so that he may easily master any specific system with a minimum of additional instruction. He will be able to analyze, evaluate and make minor modifications to such systems. Study of input/output control systems, report generators, sort and merges, monitoring and supervisory systems are included in this advanced course.

Communication Skills

The ability to express oneself is most important for success in the business world. Both technical and social skills in reading, writing, speaking and listening are emphasized in this course. Organizational communications and report writing are included as well as business letter writing.

Computer Programmer VI 1 unit

Business Simulation

Student teams carry through a complete project from system analysis, forms design, detail and general flowcharts, computer program, debugging and testing live data.

Evanston Township High School

The data processing program at Evanston Township High School, Evanston, Illinois, was cited by the State Commission on Automation and Technological Progress as the type needed in more schools. Financing of the program is shared by the Evanston Township High School Board of Education and the Illinois Occupational Research and Development Coordinating Unit of the Illinois Board of Vocational Education and Rehabilitation, which supported the program as an experiment in data processing instruction at the secondary level.[1]

Equipment includes a full array of unit record equipment and a complete IBM 1401 computer system. The following is a description of the courses available for the 1969-70 school year[2]:

I. IBM Keypunch ¼ unit

> This nine weeks' course is designed to provide a vocational job-getting skill in keypunch and verifier operation. The course is intended to meet employer requirements for beginning keypunch and verifier personnel. Eleventh and twelfth grade students may enroll.

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[1]W. G. Carpenter and R. L. Nickels, "Setting Up a Successful High School Data Processing Program," Business Education World, XLIII (May, 1968), 9.

[2]Data Processing Course Outlines, Evanston Township High School Business Education Department, 1969-70.

II. Business Data Processing — Unit Record Equipment III — 1 unit

This one-year course for eleventh grade students is designed to provide a strong vocational skill in data processing, specifically in the area of unit-record equipment. Fundamentals of data processing and "hands on" operation of the sorter, interpretor, tabulator, collator, reproducer, and associated wiring of this equipment is emphasized. The last nine weeks are spent on computer programming.

III. Advanced Tab and Computer Programming IV — 1 unit

This course for twelfth grade students requires a prerequisite of Business Data Processing--Unit Record Equipment III and a demonstrated proficiency in accounting. The course is designed to provide advanced vocational concepts in unit record equipment operation, wiring and applications, in depth computer operation, and programming experiences with related systems applications. Autocoder and Cobol are the languages taught.

Edison Junior College

Edison Junior College is a two-year college located in Fort Myers (Lee County), Florida. EJC offers an Associate of Science degree in Electronic Data Processing. A one-year certificate as a unit record equipment operator may be earned upon completion of Freshman year requirements.

Course Descriptions

I. Unit Record Equipment

This is a terminal course to train qualified operators of electro-mechanical equipment. Study and laboratory exercises in planning, wiring and operating unit record equipment is emphasized.

II. Introduction to Computer Programming

A theoretical background in the digital electronic computer is provided for students in business, mathematics and science. Areas of instruction include machine language programming, SPS, FORTRAN and COBOL.

III. Data Processing Mathematics

This course consists of a review of basic algebra, linear and quadratic functions, logarithms, matrix algebra, linear programming, Boolean properties and other computer related areas.

IV. Computer Languages

This course presents a detailed study of various programming languages, including absolute coding systems, symbolic systems and compiler systems.

V. Data Processing Applications

A study of automated systems of accounting for payrolls, inventories, accounts payable, and accounts receivable is included in this course.

VI. Computer Programming I

This is a detailed study of FORTRAN IV with applications for business, mathematics, and science.

VII. Computer Programming II

Computer Programming II is a detailed study of compiler systems other than FORTRAN, including COBOL and PL-1. The course also includes practical applications in programming advanced problems related to business, science, and math.

VIII. On the Job Training in Data Processing

This includes job training with local business firms 15 hours each week.

Summary

The Des Moines Public Schools data processing curriculum is one of the most comprehensive in the United States. Three separate curricula are offered: Keypunch Operator, requiring one year for completion, Tabulating Equipment Operator, requiring one year and a half, and a three-year Computer Programmer curriculum. If students elect the Computer Programmer curriculum, instruction begins in the tenth grade with students devoting three hours per day to data processing instruction. The three-hour period extends through the twelfth grade.

Evanston Township High School provides a nine-weeks' keypunch course and two one-year courses in unit record equipment and computer programming.

At Edison Junior College in Fort Myers a one semester terminal course trains qualified electro-mechanical operators, and an Associate of Science degree in Electronic Data Processing may be earned in two years.

CHAPTER IV

RESULTS OF THE TEACHER SURVEY

It was necessary to determine the education and experience of Lee County business education teachers in the area of data processing prior to the preparation of a teacher-development program and the incorporation of data processing into the curriculum.

Method of Procedure

The questionnaire method was used to collect data for the study. The questionnaires were mailed to the department chairmen of the four secondary schools in Lee County. Each chairman distributed the questionnaires to the business education teachers in his school. The questionnaires were returned collectively by the department chairmen.

The survey consisted of two questionnaires. One (Exhibit B) was prepared specifically for the business education department chairman. He was asked to indicate total enrollment of the business education department, course offerings, grades eligible for each course, maximum students per class in each course, and whether or not the course was offered on a semester or yearly basis.

The second questionnaire (Exhibit C) was prepared for the business education teachers with the exception of full-time distributive education and cooperative education teachers since these teachers are not included in the business education department in Lee County. This questionnaire was to determine the degree held, specific courses taken in data processing, the type of instruction and the extent of any work experience in data processing.

A cover letter (Exhibit A) was mailed to each department chairman with a carbon copy mailed to the principal of each school.

All the department chairmen returned their questionnaires. There were fifteen business education teachers returning questionnaires. All chairmen indicated 100 per cent return from the teaching staff.

Presentation of Results

Table 1, below, represents the classification of schools by size and enrollment in the business education departments. The high percentage of enrollment in business education represents the contribution that business education makes to the total educational development of students.

Table I
SIZE OF SCHOOLS AND ENROLLMENT
IN BUSINESS EDUCATION

School	*Senior High Enrollment	Bus. Educ. Enrollment	% Enrollment in Bus. Educ.
Alva	194	142	73.1
Cypress Lake	1,146	642	56.1
Fort Myers	1,829	702	38.3
North Fort Myers	696	402	57.7

*Includes grades 10, 11, 12

Fort Myers Senior High School has the largest total enrollment, and yet the percentage of students enrolled in business education is quite low (38.3 per cent) in comparison to the other three (73.1, 56.1 and 57.7 per cent). The survey revealed that Fort Myers Senior High School offered the least variety of courses (see Table II). Perhaps the small percentage of enrollment in business education may be attributed to the limited curriculum (typing, shorthand, and bookkeeping) at Fort Myers Senior High School.

Table II, below, shows the course offerings available to Lee County students by school. It includes the maximum class size reported in the four-school survey. It should be noted that no courses in data processing are being offered by any of the four schools.

Table II
BUSINESS EDUCATION CURRICULUM OFFERINGS
OF THE FOUR SECONDARY SCHOOLS IN LEE COUNTY

Title of Course	*Schools Offering Course	Total Offering Course	Semester or Yearly		Maximum Students Per Class
			S	Y	
Typewriting I	A,C,F,N	4		x	32
Typewriting II	A,C,F,N	4		x	32
Personal Typewriting	C,F,N	3	x		32
Shorthand I	A,C,F,N	4		x	32
Shorthand II	C,N	2		x	20
Accounting I	A,C,F,N	4		x	32
Recordkeeping	C,F,N	3		x	32
Business Law	A,N	2	x		30
Business Math	A,C,N	3		x	35
Business English	N	1	x		30
Vocational-Clerical	N	1		x	15
Consumer Economics	C	1	x		37
Retail Sales & Mgt.	A,C	2	x		35

A--Alva Senior High
C--Cypress Lake Senior High
F--Fort Myers Senior High
N--North Fort Myers Senior High

Table III
LEVELS OF COLLEGE WORK AND MAJOR AREA
OF STUDY OF LEE COUNTY BUSINESS EDUCATION TEACHERS

	Bus. Educ.	Other	Total	Per Cent
Bachelor's Degree Only	8		8	53.3
Master's Degree	4	3	7	46.7

Table III, above, shows the level of degrees of the business education teachers in Lee County. Of the three teachers who have master's degrees in areas other than business education, two have bachelor's degrees in business education. The master's degrees held, in addition to those in business education, are in guidance, school administration and English.

Table IV
SOURCE OF DATA PROCESSING BACKGROUND
OF BUSINESS EDUCATION TEACHERS IN LEE COUNTY

Source	Total	Per Cent
College Classes	3	20.0
Data Processing Workshops	1	6.6
On-the-Job Experience	2	13.3

Of the three teachers who have taken data processing classes in college, two have three semester hours, and one has six semester hours in data processing. Courses taken by these teachers include: Survey of Data Processing, Introduction to Data Processing, Computer Programming and Unit Record Equipment, and Data Processing and Computer Programming. Each of the preceding courses were shown on the questionnaires as having three semester hours' college credit.

One teacher had listed the study of data processing theory in a workshop of six weeks' duration.

Keypunch machines and check sorters were the equipment utilized by those teachers having on-the-job experience.

A total of ten teachers (66.6 per cent) have not received training in data processing.

CHAPTER V

TEACHER DEVELOPMENT PROGRAM IN DATA PROCESSING

It appears that lack of teacher preparation in the area of data processing has been a universal deterrent to the teaching of data processing at the secondary level. In Bangs and Hillestad's research study,[1] "Getting Teachers" ranked first as one of the leading problems in establishing the data processing instructional program in high schools and junior colleges.

It seems, however, that this is gradually being overcome as evidenced by the increasing number of high school data processing programs in operation today. Grant[2] reported that in April, 1966, about ten per cent of all schools in the United States were offering some kind of data processing instruction. In contrast, Gibson[3] stated in May, 1969, that it is relatively safe to assume that approximately 20 per cent of the high schools in the United States are being affected.

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[1]Bangs and Hillestad, Curricular Implications of Automated Data Processing for Educational Institutions, 197.

[2]C. B. Grant, "Data Processing Instruction Predicted for Most High Schools Within Five Years," Data Processing Magazine, IX (September, 1967), 36.

[3]E. Dana Gibson, "Implications of Data Processing for Teachers," Journal of Data Education, IX (May, 1969), 10.

Robert Kriegbaum categorizes teachers into two groups.[1] One group is satisfied with the status quo and fabricates a myriad of excuses to avoid learning anything new. Unfortunately, these teachers have to be forced to attend enrichment programs. The second group, the professionals, are eager to learn. With these two groups of teachers in mind, Couger[2] states the following:

> Keeping abreast of new developments in his field of specialization is difficult enough without adding the burden of acquiring a foundation in computing technology. He /the teacher/ must be convinced of the importance of such knowledge in his field to give it high priority among his retooling needs.

The American Association of Junior Colleges made a national survey of its members to determine the priority needs and conditions for training faculty and staff.[3] Two hundred eighty-eight or 38 per cent of the Association's members complied by returning the survey questionnaire. The presidents and deans who responded were asked to name up to three areas in six different curricular fields in which they most wanted additional training for their

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[1]Robert Kriegbaum, "The Way Out . . . Is Way In," Journal of Data Education, IX (February, 1969), 4.

[2]Daniel J. Couger, "Educating Faculty About Computers, Part I," Journal of Business Education, XLIV (March, 1969), 249.

[3]American Association of Junior Colleges, In-Service Training for Two-Year College Faculty and Staff (Washington, D. C.: AAJC, 1969), 25.

personnel. Under the area of Vocational/Technical, data processing ranked first among priorities for teacher training.

While designed to emphasize the need for in-service training for teachers in two-year colleges, it seems this study parallels the needs and conditions for high school teachers. To reiterate the need for teachers to keep abreast of recent developments in their area of specialization, the study states:

> . . . Within every general category of training cited, the specific course areas which are most in demand all underline the increased felt need for contemporary relevance at the two-year colleges. For example, remedial and minority studies and guidance programs, data processing, and modern engineering technology are all in very heavy demand. The need for today's instructors to learn up-dated methods of testing and measurements, the latest discoveries in learning theory, techniques of programmed instruction, and ways of keeping abreast of new educational media and technology--all of these are clearly visible in the results of the survey.[1]

In response to the preferred training conditions, the American Association of Junior Colleges' survey revealed the following:

1. 177 respondents out of 302 indicated "on campus" as the preferred training site.

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[1]Ibid., 28

2. 175 respondents out of 318 indicated "during school year" as the time of greatest benefit for in-service training.
3. 184 respondents out of 305 preferred in-service training under two weeks.
4. 164 respondents out of 299 indicated a willingness to pay up to full cost for in-service training.
5. 221 respondents out of 295 consider graduate credit for in-service training either desirable or essential.
6. Out of 296 responses, 281 felt that in-service training is either unavailable (124 respondents) or only fairly available (157 respondents).

The total sample used was 288. However, some respondents indicated more than one preference in response to each question.

There are various educational approaches which have been used in educating teachers and faculty about computers. Among these are (1) special faculty seminars, (2) computer manufacturer courses, and (3) courses sponsored by professional societies and organizations.[1]

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[1]Daniel J. Couger, "Educating Faculty About Computers--Part II, Journal of Business Education, XLIV (April, 1969), 274.

In an appraisal of methods used by eleven leading colleges and universities to educate their faculty on computers, Daniel Couger[1] found the problems most frequently encountered in faculty seminars are (1) difficulty in scheduling to avoid conflict with other academic activities, and (2) widely varying levels of knowledge on the subjects being presented, making it difficult to establish a proper level of instruction. Two admonitions related to computer representatives' schools are (1) sales propoganda is contained in lectures, and (2) limitations of the computer are seldom mentioned.

In Service Teacher Training Course

The length of time available for in-service teacher development programs varies widely. The material herein is constructed for a two-weeks' workshop introducing business education teachers to the concepts of data processing. It could be condensed by eliminating a discussion of Part VIII, Program Analysis, and Part IX, Programming Languages. Those sections marked with an asterisk * are areas essential for more complete understanding of the literature and should not be deleted from the course outline.

Flexibility can also be achieved relative to the depth of discussion of each topic and the extent to which the suggested activities and instructional materials are used.

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[1] Ibid.

The activities and instructional materials suggested at the end of the outline constitute an integral part of the program. These should be employed when possible, and definitely passed along to teachers for possible use in their own classrooms.

It is highly recommended that current periodicals on data processing be made available to teachers and their students. With such phenomenal changes in this area, there is no other way to keep abreast of the latest developments. A listing of periodicals with subscription rates is given on page 74.

The professional societies noted on page 74 provide magazines with membership. These magazines provide valuable literature relating to the teaching of data processing. The Society of Data Educators makes available to its members excellent inexpensive teaching aids.

The bibliography for use in teaching the course precedes the course outline. The major text used to develop the outline was Computers in Business by Donald Sanders.

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The May, 1967, issue of Business Education Forum was devoted to teaching methods of data processing. The following articles are from this issue:

Bux, William E. ". . . Through the Systems Concept," 5-7.

Davenport, Robert. ". . . Through Use of the Flowchart," 10-13.

Keuler, Glenn R., Keuler, Daryl. ". . . Through Teaching Unit Record Data Processing Without Equipment," 13-16.

Robichaud, Beryl. ". . . Through Clerical Activities in the Modern Office," 8-10.

Wagner, Gerald E. ". . . Through Forms Design," 17-19.

Objectives of the Course

1. To develop an acquaintanceship with computer vocabulary.
2. To familiarize teachers with types of hardware available and various forms of input/output.
3. To develop an understanding of the evolution of early data processing systems to management information systems.
4. To introduce the central processing unit of the electronic computer, including binary arithmetic.

5. To provide an acquaintanceship with techniques used in programming and systems analysis.
6. To introduce the most widely used programming languages.
7. To provide a bibliography for self education in the field of data processing.
8. To introduce the job opportunities available in data processing.
9. To demonstrate methods of teaching data processing.

Outline of the Course

* I. Introduction

- A. Definition of data
- B. Data versus information
- C. Definition of data processing
- D. Need for data processing

* II. Evolution of data processing

- A. Manual
- B. Mechanical
- C. Electronic
- D. Size and scope of computer market

III. Punched card development

- A. Card structure
- B. Codes
- C. Fields
- D. Equipment
  1. Keypunch
  2. Verifier
  3. Sorter
  4. Interpreter
  5. Collator
  6. Reproducer
  7. Tabulator

* IV. Revolution in computer technology

A. Software
   1. Definition
   2. Cost
   3. Application packages

B. Hardware
   1. Size
      a. Tubes
      b. Transistors
      c. Integrated circuits
   2. Speed
      a. Millisecond
      b. Microsecond
      c. Nanosecond
   3. Cost
   4. Storage Capacity
      a. Memory
      b. External online
      c. Offline

* V. Computer Concepts

A. Online processing
B. Batch processing
C. Real time
D. Time sharing
E. Total integrated system
F. Analog computer
G. Digital computer

* VI. Input/Output devices

A. Punched cards
   1. Dual purpose I/O
   2. Advantages
   3. Disadvantages

B. Punched paper tape
   1. Dual purpose I/O
   2. Advantages
   3. Disadvantages

C. Magnetic tape
   1. Rapid input/output
   2. off-line storage medium
   3. Advantages
   4. Disadvantages

D. MICR
   1. Applications
   2. Advantages
   3. Disadvantages
E. OCR
   1. Applications
   2. Advantages
   3. Limitations
F. Display station
   1. Applications
   2. Advantages
G. Typewriter terminal
H. Voice response
   1. Touch tone telephone
   2. Punched card applications
I. High Speed printer

VII. Electronic computer central processing unit

A. Internal storage unit
   1. Addresses
      a. Variable
      b. Fixed
   2. Types of internal storage devices
      a. magnetic drum
      b. magnetic core
      c. thin films
      d. memory rods
B. Arithmetic logic unit
   1. Binary arithmetic
   2. Calculations
   3. Comparisons
C. Control unit
   1. Nervous system
   2. Selection, interpretation, execution of program

VIII. Program analysis

A. Flowcharts
B. Decision tables

IX. Programming languages

A. Fortran
B. Cobol
C. Basic

X. Evolution of computer applications

A. Custodial
B. Historical
C. Planning and control

XI. Employment opportunities
A. High school graduates
1. Keypunch operators
2. Verifier operators
3. Tabulating machine operators
4. Card-tape converter operators
5. Sorting machine operators
6. Tape librarians
7. Computer equipment operators
B. Post-high school training
1. Programmers
2. Systems analysts
C. College graduates
1. Programmers
2. Systems Analysts
3. Systems designers

XII. Teaching Methods

A. Integration in existing courses
1. Bookkeeping/accounting
2. Typewriting
3. Office practice
4. Consumer economics
5. General business
B. Units in existing courses
1. Practice sets
2. Simulated activities
C. Implementation of new courses
D. Professional libraries in business departments
1. Periodicals (See page 74.)

Suggested Activities

I. Have a panel discussion composed of members from one of of the following groups:

A. Computer vendor representatives

Friden	General Electric
IBM	Univac
Honeywell	Control Data Corp.
Burroughs	NCR
RCA	Philco

B. Four or five representatives from local data processing installations

C. Members of nearby post high school education facilities to discuss their data processing programs (college, junior college, vocational-technical)

II. Provide a guest speaker from one of the representatives mentioned above.

III. Plan field trips to various data processing installations.

Suggested Instructional Materials

Transparencies

1. Unit record equipment (prepared from 3M foils)
2. flowchart
3. decision table

Films

The following list is suggestive only. A more complete listing may be obtained by ordering Guide to Data Education Films, which contains detailed descriptions of 550 films. To order send $3.25 to SDE Publishing Office, R2-76 Union, Northfield, Vermont, 05663.

1. "IDP," 35 minutes, 16 mm., color, Standard Register Co.

2. "Automation in Today's Modern Office," 54-frame filmstrip with script to be read by instructor, Friden, Inc.

3. "Automation," from Edward R. Murrow's See It Now program on CBS, 84 minutes, 16 mm.

4. "This is Automation," 30 minutes, 16 mm., General Electric Company

5. "Digital Computer Techniques," 20 minutes, color, sound, 16 mm., Norwood Films, 926 New Jersey Ave., N. W., Washington, D. C.

6. "Introduction to Digital Computers," 25 minutes, color, sound, 16 mm., UNIVAC, Division of Sperry Rand, 315 Park Ave., New York, New York 10010

7. "What is EDP?" 13 minutes, color, sound, 16 mm., IBM Film Activities, Departmentof Information, 590 Madison Avenue, New York, New York 10022

8. "Computer Programming," 27 minutes, black and white, 16 mm., Systems Development Corporation, 2500 Colorado Avenue, Santa Monica, California

Materials for Handout

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2. Wenner, James F. A High School Orientation Course in Data Processing. Monograph 114. Cincinnati: South-Western Publishing Co., July, 1966.

3. Wood, Merle W. The Teaching of Automated Data Processing in the High School. Monograph 116. Cincinnati: South-Western Publishing Co., April, 1967.

4. Copies of a decision table and flowchart.

Professional Societies for Business Teachers

I. National Business Education Association

   A. Business Education Forum
   B. National Business Education Quarterly

II. Society of Data Educators

   A. Journal of Data Education
   B. Free and inexpensive materials

Periodicals

Administrative Management, 51 Madison Avenue, New York, New York 10010 ($6/year, $9/2 years, $11/3 years)

Business Automation, 288 Park Avenue W., Elmhurst, Ill. 60126 ($15/year, Free to data educators)

Computers and Automation, 815 Washington Street, Newtonville, Mass. 02160 ($18.50/year)

Data Processing Magazine, 134 N. 13 Street, Philadelphia, PA 19107 ($8.50/year)

Datamation, 1830 W. Olympic Blvd., Los Angeles, CA 90006 ($15/year)

Fortune, 540 N. Michigan Ave., Chicago, ILL 60611 ($14/year)

Harvard Business Review, 108 Tenth Street, Des Moines, IA 50305 ($12/year)

Journal of Business Education, 15 South Franklin Street, Wilkes-Barre, PA 18701 ($5/year, $9/2 years)

Journal of Data Management, Data Processing Management Assn., 505 Busse Highway, Park Ridge, ILL 60068 ($5/year)

Journal of Systems Management, 24587 Bagley Road, Cleveland, OH 44138 ($15/year)

Journal of Educational Data Processing, Educational Systems Corp., P. O. Box 2995, Stanford, CA 94305 ($9/year)

Complimentary Magazines

Computing Report and Data Processor, IBM Data Processing Division, 112 E. Post Road, White Plains, NY 10601

Computer Decisions, Hayden Publishing Company, Inc., 850 Third Ave., New York, NY 10022

Data System News, United Business Publications, Inc., A subsidiary of Media Horizons, Inc., 200 Madison Ave., New York, NY 10010

Modern Office Procedures, Industrial Publishing Company, P. O. Box 91368, Cleveland, Ohio 44101

Think Magazine, IBM, Armonk, NY 10504

Software Age, Press Tech, Inc., 1020 Church St., Evanston, IL 60201

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The results of the teacher survey clearly indicate that the majority of business education teachers in Lee County have not been exposed to data processing. There is a definite need for a county-wide data processing instructional program for business education teachers.

In metropolitan areas where the job opportunities for unit record equipment operators are substantial, the costs involved in a full line of unit record equipment may be justified. Realistically, however, very few schools have the resources to provide a full array of unit record equipment for job training. These schools should provide one or two keypunch machines, depending on the size of the business education department, to acquaint students with their operation. Students rotating weekly on these machines would at least gain some experience on them.

Generally, employers prefer their employees to be familiar with the concepts of data processing. It appears the mechanical aspects of data processing can be taught in a

very short time through on-the-job training. With a rapidly expanding and changing field such as data processing, teaching to apply technical means becomes as important as specific vocational training. The machinery will change, but the concepts remain the same.

Data processing should be offered to all students in the high school and not limited to business education students. Each student, no matter what his goal in life, will be affected by data processing.

The high school does not appear to be the place to train programmers or systems analysts. In almost every case, college is required for these positions. In many instances, two years of college or equivalent vocational-technical training is sufficient for programmers.

That careers in electronic data processing are numerous and profitable is unquestionable. The high schools should provide a stimulus for advanced training in EDP.

There can be harm in establishing an EDP curriculum that is so demanding that students miss courses that lay a foundation for future study in data processing. As brought out in Wenner's study, it is much easier to train programmers than it would be to train accountants, engineers or scientists.

It is recognized that the data processing curriculum cannot be static; it must be continually updated. An up-to-date, well informed data processing instructor is essential. In the field of data processing, it is a necessity for teachers to keep abreast of current literature.

Community surveys and advisory committees represent two of the best ways to assure that the data processing curriculum is relevant to the community.

Recommendations

1. The teacher development program in this study should be required in-service training for all Lee County business education teachers.

2. A one-semester introductory course, Introduction to Computers, should be offered to eleventh and twelfth grade students.

3. Students who achieve a satisfactory grade in the first course may take Computer Programming. This one-semester course would include FORTRAN IV, BASIC, and a brief introduction to COBOL. Since it is established that post high school education is required for the great majority of programmers, the purpose of Computer Programming will be to introduce students to the different languages and to stimulate them to further their education in this lucrative field.

4. A minimum of two keypunch machines should be placed in the second-year typewriting classroom. The typing II course is flexible enough so that all typing II students could gain some experience on the keypunch machines.

5. It is strongly recommended that online terminals be provided for student use in the Computer Programming course as opposed to batch processing. This would eliminate the necessity of providing unit record equipment for students.

6. An advisory committee of Lee County businessmen should be established to guide the direction of the data processing curriculum.

7. It is believed that actually seeing the data processing equipment is an important psychological incentive to learning concepts of data processing. The high schools should be encouraged to cooperate with Edison Junior College and local businesses having EDP equipment in arranging field trips.

8. A survey should be made to determine employer requirements in data processing in the Lee County area. The possibilities of a high school work-experience program in data processing should also be investigated.

9. Lee County teachers should be encouraged to take summer courses or obtain summer jobs in data processing.

10. No teacher should graduate with a degree in business education without a minimum requirement of an introductory data processing course, and preferably with one programming language skill.

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EXHIBIT A

1705 Wylie Street
Missoula, MT 59801
December 5, 1969

Dear Chairman:

I am preparing a thesis study on the incorporation of data processing into the business education curricula in the Lee County Secondary Schools. In order to do this, I need specific information regarding teacher qualifications and course offerings from each of the four secondary schools.

Would you please distribute the enclosed questionnaires to the teachers in your department who are not 100 per cent Distributive Education or Cooperative Education instructors and return them to me in the self-addressed stamped envelope provided. Also enclosed is a questionnaire prepared especially for the head of the business education department. Would you please complete this in addition to one of the others.

You may be interested to know that I was formerly in the business education department at North Fort Myers Junior Senior High School and will be returning to Fort Myers next year.

It will be impossible for me to prepare an effective study without your cooperation. Hopefully this will strengthen the business education curricula and benefit Lee County. Your help will be sincerely appreciated.

Very truly yours,

Mrs. Madeleine Doran

Encls.
cc: Principal

EXHIBIT B

QUESTIONNAIRE FOR BUSINESS EDUCATION DEPARTMENT HEAD

SCHOOL

_____Alva
_____Cypress Lake
_____Fort Myers
_____North Fort Myers

TYPE OF SCHOOL AND GRADES INCLUDED

_____Jr.-Sr. High Including grades_____in Junior High
Including grades_____in Senior High

_____Senior High Including grades_____

ENROLLMENT

(If Senior High complete A and C only; Jr.-Sr. High complete A, B, and C.)

_____A. Total School Enrollment
_____B. Total Enrollment of Senior High Grades
_____C. Total Enrollment in Business Education Department (excluding cooperative programs)

CURRICULUM

Please complete the following chart for those subjects offered in your curriculum. If courses are taught under another name, please indicate your course title. If there are additional courses, please include these at the end of the chart.

Subject	Grades Eligible	Maximum Students Per Class	Semester or Yearly Course Offering	
			S	Y
Personal Typewriting				
Typewriting I				
Typewriting II				
Shorthand I				
Shorthand II				
Office Practice				
General Business				
Bookkeeping I				
Business Law				
Business Math				
Exploratory Business				
Office Machines				

EXHIBIT C

QUESTIONNAIRE FOR BUSINESS EDUCATION TEACHERS* IN LEE COUNTY, FLORIDA

I am writing my Master's thesis on the "Incorporation of Data Processing into the Business Education Curricula in Lee County, Florida." Your answers to the following questions will be sincerely appreciated. Upon completion, please return the questionnaire to your department chairman. Your name will not be required in this survey.

Madeleine Doran

SCHOOL

_____Alva
_____Cypress Lake
_____Fort Myers
_____North Fort Myers

EDUCATION

College or University	Degree Earned	Major

DATA PROCESSING OR COMPUTER TRAINING

Education

Title of Course	Year Taken	Quarter Hours	Semester Hours

Other Training

Type	Duration	Year

Experience

Company	Length and Year	Duties

*Excluding Distributive Education and Cooperative Education teachers when these are the only courses taught.